August 26, 1996

Mr. Steven Silva
Wastewater Management Branch
U.S. Environmental Protection Agency
J.F. Kennedy Building
Boston, Massachusetts 02203-2211

Dear Mr. Silva:

The U.S. Fish and Wildlife Service (Service) has reviewed the proposed National Pollutant Discharge Elimination System (NPDES) Permit (#ME0002003) for the following activity: discharge of treated process wastewater, non-contact cooling water and storm water runoff from the Lincoln Pulp and Paper Company, Inc., to the Penobscot River in Lincoln, Maine. Your request for formal consultation was received on August 4, 1994. We acknowledged receipt of the request to initiate formal consultation in our August 29, 1994 letter, and at that time requested additional information to complete the initiation package. Your staff provided the additional information, which we received on September 8, and September 16, 1994. Subsequently, we received final analytical results for AHH-inducing PCB congeners on October 31, 1994.

This document represents the Service's biological opinion on the effects of the proposed reissuance of a NPDES permit to the Lincoln Pulp and Paper Company on the threatened bald eagle (*Haliaeetus leucocephalus*) in accordance with section 7 of the Endangered Species Act (ESA) of 1973, as amended, (16 U.S.C. 1531 et seq.). This final biological opinion was preceded by draft opinions dated November 23, 1994 and June 12, 1995.

This opinion is based in part on information contained in EPA's August 1993 draft permit; the August 1992 and August 1993 Fact Sheets; and the December 1983 and August 1992 permit (#ME0002020) for the James River-Norwalk, Inc. mill at Old Town.

CONSULTATION HISTORY

Extensive information on the proposed action and its potential effect on the endangered (and as reclassified, threatened) bald eagle was exchanged during the informal and formal consultation process between our agencies. The consultation process is summarized in Appendix A.

Biological Opinion:

The Service has geographically separated bald eagles in the lower 48 states into recovery populations termed Recovery Regions. Maine is part of the 24-state, Northern States Recovery Region (NSRR) for bald eagles. In developing biological opinions pursuant to section 7 of the ESA, Service policy provides for the evaluation of jeopardy to a vertebrate species such as the bald eagle, within its specific recovery region, rather than across the species' entire range within the coterminous 48 states.

For the purposes of this consultation, the scope of the effects of the action (the action area) is limited to those bald eagles nesting along the Penobscot River at or downriver from Lincoln, and to those eagles that winter and consume contaminated prey in affected waters.

It is the Service's biological opinion that renewal of Lincoln Pulp and Paper's NPDES permit will not jeopardize the continued existence of the bald eagle. The action will not jeopardize the bald eagle because the anticipated adverse impacts, which will affect those eagles utilizing a portion of the Penobscot River, will not preclude recovery and appreciably reduce the survival of eagles in the NSRR. Critical habitat has not been designated or proposed for this species; therefore, none will be destroyed or adversely modified by the proposed action.

DESCRIPTION OF THE PROPOSED ACTION:

The proposed action is the issuance of a National Pollutant Discharge Elimination System (NPDES) Permit (#ME0002003) for the discharge of treated process wastewater, non-contact cooling water and storm water runoff from the Lincoln Pulp and Paper Company, Inc., to the Penobscot River in Lincoln, Maine. The draft permit proposes an instream concentration for the Penobscot River of 0.0078 pg/l 2,3,7,8-tetrachloro-dibenzo-*p*-dioxin (TCDD) at harmonic mean flow, and a continuous maximum daily discharge limit of 200 pg/l for 2,3,7,8-tetrachloro-dibenzo-furan (TCDF).

Lincoln Pulp and Paper Company (LP&P) is currently engaged in the manufacturing of Kraft pulp, fine paper and tissue. LP&P is currently producing approximately 410 air-dried tons per day (ADTPD) of bleached Kraft pulp. LP&P proposes a two tier production increase over the next five years; tier 1 to 450 ADTPD and tier 2 to 540 ADTPD. Treated pulp wastewater, treated paper process wastewater, and non-contact cooling water will continue to be discharged into the Penobscot River. Landfill leachate and storm water runoff will continue to be conveyed to the Penobscot River by way of the former Mattawancook Stream bed.

Several process changes recently implemented by LP&P, such as the substitution of chlorine dioxide for chlorine, were identified in discussions with representatives of LP&P, and in an April 1995 Dioxin Fact Sheet. LP&P voluntarily increased its chlorine dioxide substitution in 1995 to the 30% level (D. Walsh, pers. comm. April 1996).

Species Account/Environmental Baseline:

In 1978, the bald eagle was listed pursuant to the Endangered Species Act as an endangered species in Maine and 42 of the other contiguous states, and as threatened in the remaining five states (USFWS 1979). At that time, environmental contaminants were shown to be affecting many of the eagle populations (Wiemeyer et al. 1972). Other factors contributing to the eagle's decline included human disturbance at nest sites, habitat loss, and shooting (Palmer 1988). In recognition of the recently improved status of bald eagles, in August 1995 the species was classified throughout the 48 coterminous states as threatened.

The bald eagle is listed as a threatened species under Maine's endangered species law (12 MSRA, section 7753). Maine legislation (12 MRSA, Chapter 713, and Ch. 8.05) allows eagle nests to be designated as essential habitat. Although this legislation protects the eagle from human disturbance and destruction of habitat, it was not intended to regulate point or nonpoint pollution and other indirect causes that may lead to reproductive failure.

Current Status:

In 1995, there were 1,883 known occupied breeding areas distributed across the Northern States Recovery Region, with an average productivity rate of approximately 1.20 young produced per occupied breeding area.

Although the Maine bald eagle population has experienced a gradual but steady increase in the number of occupied nest sites in recent years, the population continues to exhibit reduced reproductive rates. In approximately 30 years of population monitoring, Maine eagles have never reached the production level of 1.00 young/occupied nest, a rate regularly surpassed by healthy eagle populations (Sprunt et al. 1973; Newton 1979). In 1995, bald eagles in Maine occupied 192 nest sites and produced 176 eaglets for a mean production rate of 0.92 young/occupied nest. The ten year mean production rate for the statewide population is 0.81 young/occupied nest. The statewide average productivity is influenced by the productivity of estuarine and marine eagles, which make up a significant component of the statewide average and which generally demonstrate higher productivity than eagles nesting in other habitat types.[1]

[1] A nesting pair is considered successful if the eaglet has survived until Maine Department of Inland Fisheries and Wildlife (MDIFW) conducts a final production survey when the young are approximately 10 weeks old.

There are six bald eagle nesting territories along the Penobscot River between Lincoln and Milford (Figure 1). Eagle pairs at these sites have a mean, ten-year production rate of 0.61 young/occupied nest. This represents a 25% reduction in productivity rates as compared to the statewide average of 0.81. (The Service recognizes that because of the small sample size and the high level of variance exhibited by these data, this conclusion does not reach the level of statistical significance). Although eagle pairs at and below Lincoln have been generally more successful since 1990, the five-year average productivity, 0.76 young/occupied nest, remains below the five-year statewide average (0.85).

The six eagle pairs between Lincoln and Milford appear to have a productivity rate that is comparable to that of other riverine nesting eagles in the state. However, these other rivers receive industrial discharges, and the Service believes that the productivity of eagles nesting on these rivers may also be influenced by exposure to contaminants.

Within New York and Massachusetts, bald eagles currently nest along several rivers where there are no Kraft process paper mills. Combined, these river nesting eagles have produced 41 fledglings from 37 nesting attempts, exhibiting an average productivity of 1.1 young/pair (P. Nye, NY Dept. of Environmental Conservation and B. Davis, MA Div. of Fisheries and Wildlife, in litt. January 1996).

It is not possible to say with certainty what the specific cause or causes of reduced productivity may be in either the eagles below Lincoln or other riverine eagles in Maine, although the Service believes some portion of that reduced productivity is the result of dioxin contamination in fish. We note that the two nesting territories within approximately two miles of LP&P have a mean, five-year (1991-1995) production rate of 0.50 young/occupied nest.

The Maine eagle population is the stronghold for the species in the Northeast, representing approximately 95% of the eagles nesting in New England. The continued health and expansion of the Maine population is crucial to the recovery of the species in the northeastern United States.

Ecology of Maine Bald Eagles:

Diet composition and a reproductive life of 20-30 years (Stalmaster 1987) may significantly influence the bald eagle's exposure to environmental contaminants. Eagles generally form breeding pairs and establish nesting territories when they sexually mature at about five years of age. Bald eagles demonstrate extreme loyalty to a nesting territory, and will continue to use the same territory throughout their lives. An individual territory may contain several alternate nests that are constructed over the years of territory occupancy. During the winter months in Maine, eagles nesting in the interior sections may travel to areas of open water to access prey, while coastal-nesting eagles remain on their territories year round. On average, nesting females will lay between one and three eggs. Nesting is generally initiated in mid-March to April, and is followed by a 35-day incubation period. Eaglets fledge from the nest at approximately 12 weeks of age, although they may remain in the nesting territory for an indefinite period of time.

Figure 1

Bald eagles represent top level predators, and therefore have increased risk of exposure to contaminants that biomagnify within food chains. In Maine, eagles consume high percentages of piscivorous avian species, which may further increase their exposure to environmental contaminants (Todd 1979, Tillitt et al. 1991a, Welch 1994). Eagles nesting in riverine habitats in Maine were reported to consume a diet of 66% fish, 20% birds, and 12% mammalian prey (Welch 1994). The Service believes that the mainstem of the Penobscot River constitutes the major foraging area for eagles nesting along the river. Bald eagles are regularly observed foraging along the river and little information is available to indicate that the eagles forage outside the system during the nesting season (C.Todd, MDIFW, pers. comm.).

Although nesting eagles are distributed throughout the State during the breeding season, several areas have been identified as significant concentration areas for eagles wintering in Maine. These include Merrymeeting, Frenchman, and Cobscook Bay, and the lower Penobscot River and Bay. Contaminant concentrations in the prey from wintering areas may significantly affect the ability of female eagles to lay viable eggs following their return to nesting territories. The females' body condition and the availability and quality of prey items early in the season may also influence the contaminant burdens in the eggs (Grier 1974).

Contaminants:

Investigations conducted on Maine bald eagles between 1970 and 1990 identified elevated levels of environmental contaminants (Wiemeyer et al. 1984, 1993). Some of these contaminants have been significantly correlated with reduced reproductive rates in bald eagles. Recent contaminant analyses conducted on blood and feather samples from nestling bald eagles and unhatched eggs demonstrated that the Maine population continues to be exposed to elevated levels of PCBs, mercury, DDTs, and dioxin equivalents (TCDD-EQ) (Welch 1994). Although it appears that the reduced reproductive rates of the Maine eagle population are associated with elevated contaminant concentrations, little is currently known regarding the effect that TCDD and TCDF may be having on the population.

In 1992, 12 addled eggs and blood samples from six nestlings were analyzed for TCDD-EQ using the H4IIE bioassay method (Tillitt et al. 1991b). Concentrations in blood samples from Penobscot River nest sites ($\bar{x}$ = 1.20 pg TCDD-EQ/g) exceeded levels observed in coastal nesting eagles ($\bar{x}$ = 0.84 pg TCDD-EQ/g). None of the 12 eggs analyzed were collected from a riverine system, or originated in the Penobscot River watershed.

Six additional blood samples, and three addled eggs (from two nest sites), were collected from the Penobscot River watershed and submitted for contaminant analyses in 1993 (Figure 2). These samples were analyzed using gas chromatography (organochlorines, polychlorinated dioxins, furans, and planar PCBs) and high resolution mass spectrometry (AHH PCB congeners). TCDD-EQ may also be estimated for these samples by summing the toxicities of the individual dioxin-like congeners, relative to 2,3,7,8 TCDD (Ahlborg et al. 1994). However, this method is simply additive, and does not take into consideration interactions among the congeners and other synthetic organic compounds that may be present (Tillitt et al. 1991a, Giesy et al. 1994).

To date, the majority of congener-specific analytical work in birds has been restricted to eggs of a limited number of species. Therefore, it is difficult to interpret congener-specific concentrations in Maine bald eagle blood. Analysis of Maine eagle blood samples, from eaglets sampled along the West Branch of the Penobscot River (Tables 1 & 2), indicates that many of the congeners are below detection limits or are present in very low concentrations. Concentrations of congeners varied among the eaglets sampled along the mainstem of the Penobscot. Contaminant analysis also indicated that eagles nesting along the Penobscot River are currently being exposed to polychlorinated dibenzo-p-dioxins (PCDDs) and dibenzofurans (PCDFs) (Table 3).

As expected, the highest concentrations of PCB congeners, PCDDs, and PCDFs were recorded in the unhatched eggs versus the eaglet blood. However, little data currently exists on the effects that these compounds have on bald eagle reproductive and survival rates. Using toxic equivalency factors reported by Ahlborg et al. (1994) and Bosveld et al. (1995) to calculate TCDD-EQ, the levels observed in the eggs ranged from 1.820 - 84.938 pg/g. Concentrations of both 2,3,7,8-TCDD and TCDD equivalents (TCDD-EQ) indicate that contaminant concentrations in all three eggs exceed the No Observable Adverse Effect Level (NOAEL) of 1 pg/g reported by the Service assessment of potential dioxin effects to eagles along the Columbia River and the Great Lakes. Although these eggs were collected 10-12 miles upstream of LP&P, the eagles' diets prior to the nesting season would determine contaminant concentrations in the eggs. We have no specific information regarding where these eagle pairs may have foraged prior to the nesting season. However, based on general observations of eagle movements and feeding behavior during the nonbreeding season, the Service believes that their foraging territories included areas upstream and downstream of Lincoln. Standard organochlorine and mercury analysis of the egg and blood samples (Table 4) indicates that total PCBs in all three eggs, and mercury in the egg from nest 190B, exceeded concentrations associated with reduced reproductive rates in bald eagles (Wiemeyer et al. 1993).

	Town	Nest#	PCB #28	PCB #44	PCB #52	PCB #66	PCB #101	PCB #108	PCB #110
Blood	Millinocket	98A	N.D.	N.D.	1.03	0.57	3.59	4.56	4.13
	W[illegible]	151A	N.D.	1.01	1.27	N.D.	1.40	2.12	2.25
	Lincoln	154B	N.D.	0.97	N.D.	N.D.	0.87	1.89	1.81
	Brewer	199A	N.D.	1.78	1.44	0.43	1.40	1.35	1.06
	Plymouth	182A	N.D.	N.D.	N.D.	N.D.	0.89	3.03	N.D.
	T6R5 Twp WELS	91A	N.D.	N.D.	N.D.	0.57	0.30	4.80	N.D.
Eggs	Woodville	190B	3.70	2.32	3.98	33.02	202.13	247.89	190.59
	Woodville	208A	7.74	4.40	7.52	65.28	231.41	414.77	262.75
	Woodville	208A	5.98	4.19	6.01	66.40	200.61	406.08	251.96

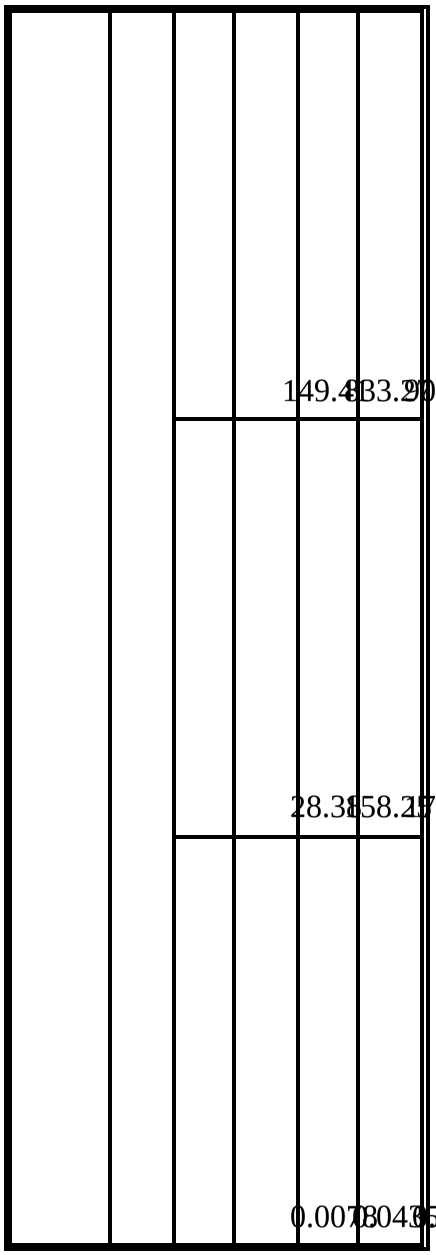
	Town	Nest#	PCB #153	PCB #187	PCB #180	PCB #195	PCB #206	PCB #209
Blood	Millinocket	98A	22.13	6.23	15.09	0.89	N.D.	N.D.
	Woolwich	151A	11.44	2.29	15.26	N.D.	N.D.	N.D.
	Lincoln	154B	6.29	1.57	9.16	N.D.	N.D.	N.D.
	Brewer	199A	7.50	1.44	10.84	N.D.	N.D.	N.D.
	Plymouth	182A	22.03	6.06	19.43	0.89	2.48	N.D.
	T6 R[illegible]	91A	25.07	7.30	19.97	0.96	2.00	N.D.
Eggs	[illegible]	190B	2153.[illegible]	739.1[illegible]	2109.[illegible]	125.2[illegible]	33.10	N.D.
	[illegible]	208A	2[illegible]	[illegible]00.0[illegible]	[illegible]	[illegible]0.5[illegible]	59.41	14.33
	Woodville	208A	[illegible]04.77	[illegible]27.96	[illegible]22.46	[illegible]06.15	71.56	17.69

	Town	Nest#	PCB #105	PCB #114	PCB #118	PCB #123	PCB #138	PCB #158	PCB #166
Blood	Millinocket	98A	0.38	N.D.	N.D.	N.D.	0.09	N.D.	N.D.
	Winn	151A	0.38	0.01	0.56	N.D.	6.00	0.35	N.D.
	Lincoln	154B	0.04	N.D.	0.19	N.D.	2.40	0.13	N.D.
	Brewer	199A	0.43	N.D.	0.14	N.D.	1.40	0.11	N.D.
	Plymouth	182A	0.10	N.D.	0.10	N.D.	0.69	0.04	N.D.
	[illegible]	91A	0.05	N.D.	N.D.	N.D.	0.03	N.D.	N.D.
Eggs	[illegible] WELS	190B	62.00	2.50	96.00	5.80	1500.00	60.00	N.D.
	Woodville	208A	39.00	1.90	89.00	N.D.	760.00	43.00	1.20
	Woodville	208A	49.00	N.D.	2.10	N.D.	130.00	0.47	N.D.

	PCB 189	N.D.	N.D.	N.D.	0.02	N.D.	N.D.	2.50	1.40	0.05	
	PCB 170	0.10	0.52	0.83	2.90	0.64	N.D.	9	20.00	4	40.00
	PCB 157	N.D.	N.D.	0.01	0.03	0.01	N.D.	6.70	6.20	28.00	
	PCB 156	N.D.	0.04	0.06	0.19	0.04	N.D.	45.00	31.00	0.84	
	PCB 167	N.D.	N.D.	0.01	0.02	N.D.	N.D.	3.20	2.50	2.00	
	PCB 128	0.45	4.10	0.12	0.47	0.17	0.22	130.00	80.00	0.04	
	Nest#	98A	151A	154B	199A	182A	91A	190B	208A	208A	
	Town	Millinocket	Lincoln	Brewer	Plymouth	T6 R5 WELS	Woodville	Woodville			
	Blood							**Eggs**			

			208A	0.24	N.D.	0.48	0.21	0.15	0.27	N.D.	N.D.		0.85	0.83	4.12	0.55	4.70
			208A	6.12	1.43	9.64	3.36	2.52	3.25	N.D.	N.D.		23.50	22.30	N.D.	N.D.	21.00
			190B	24.80	2.03	11.90	2.51	3.27	11.80	15.50	15.60		18.60	26.30	2.80	5.72	26.00
			191A	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.		N.D.	N.D.	N.D.	N.D.	4.36
			182A	N.D.	0.97	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.		N.D.	1.36	N.D.	N.D.	1.89
			154B	1.20	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.		N.D.	N.D.	N.D.	N.D.	5.58
			151A	2.18	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.		N.D.	N.D.	4.31	3.27	7.07
			98A	2.01	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.		N.D.	N.D.	1.53	N.D.	5.21
			Compound	2	1	3	3	3	3	3	3		3	3	3	3	3

	Town	Nest#	Total PCBs	DDE	Total DDTs	Total BHC	Total Chlordane	Hg
Blood	Millinocket	98A	93.59	24.48	25.78	N.D.	4.98	642.00
	Winn	151A	60.13	13.82	13.72	4.90	7.52	182.00
	Lincoln	154B	40.47	26.72	26.69	N.D.	5.02	206.00
	Brewer	199A	41.35	17.93	19.95	N.D.	5.53	181.00
	Plymouth	182A	30.89	38.98	39.02	N.D.	6.91	606.00
	T6 R1 Twp	91A	102.70	28.35	28.23	3.90	7.81	166.00
Eggs	WELS	190B	8048.80	1013.29	2549.40	N.D.	102.30	628.00
	Woodville	208A	8172.60	2940.25	4088.40	2.90	659.50	130.00
	Woodville	208A	4001.10	357.14	1015.30	2.20	566.80	245.00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0.007

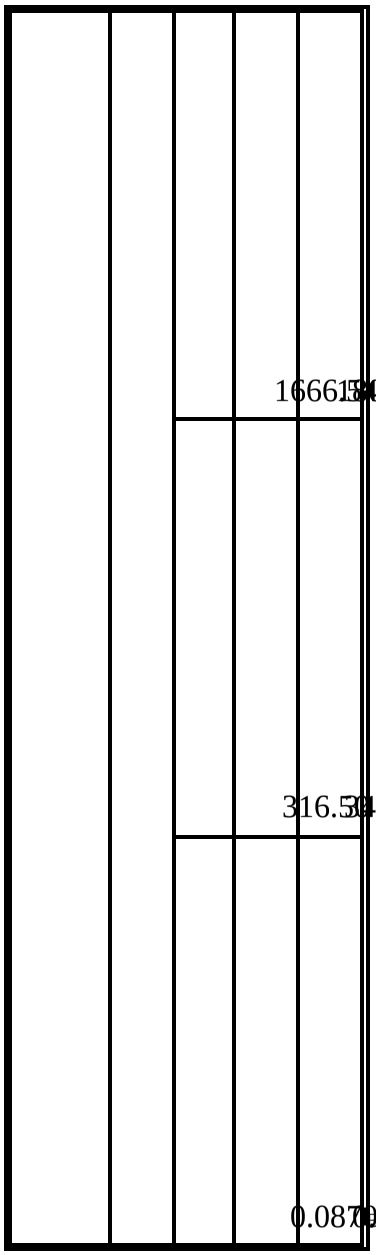
BAF	BMF	No Observable Adverse Effect Level (pg/g) 0.7	1.0	7.0
White Sucker 187,800	(-50%): 51	0.00007	0.00010	0.00073
	(-25%): 76	0.00005	0.00007	0.00049
	102	0.00004	0.00005	0.00036
	(+25%): 127	0.00003	0.00004	0.00029
	(+50%): 153	0.00002	0.00004	0.00024
SM Bass 35,666	(-50%): 51	0.00038	0.00055	0.00385
	(-25%): 76	0.00026	0.00037	0.00256
	102	0.00019	0.00027	0.00192
	(+25%): 127	0.00015	0.00022	0.00154
	(+50%): 153	0.00013	0.00018	0.00128

BAF	**White Sucker 18,425**					**SMC Bass 363,580**				
BMF	(-50%): 51	(-25%): 76	102	(+25%): 127	(+50%): 153	(-50%): 51	(-25%): 76	102	(+25%): 127	(+50%): 153
No Observable Adverse Effect Level (pg/g)										
0.7	0.00016	0.00010	0.00008	0.00006	0.00005	0.00038	0.00026	0.00019	0.00015	0.00012
1.0	0.00022	0.00015	0.00011	0.00009	0.00007	0.00054	0.00036	0.00027	0.00021	0.00018
7.0	0.00155	0.00103	0.00078	0.00062	0.00052	0.00375	0.00250	0.00188	0.00150	0.00125

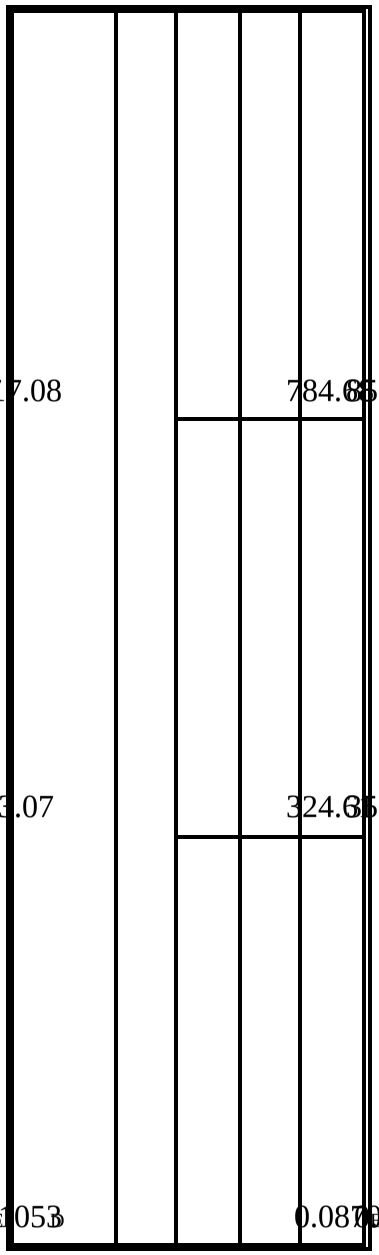
0.0078[A]	28.38	149.41
0.0435[B]	158.25	833.27
0.0472[C]	172.80	904.14
0.0526[D]	191.36	1007.58

0.0078[A]	29.10	70.35
0.0435[B]	162.30	392.34
0.0472[C]	176.11	425.71
0.0526[D]	196.26	474.42

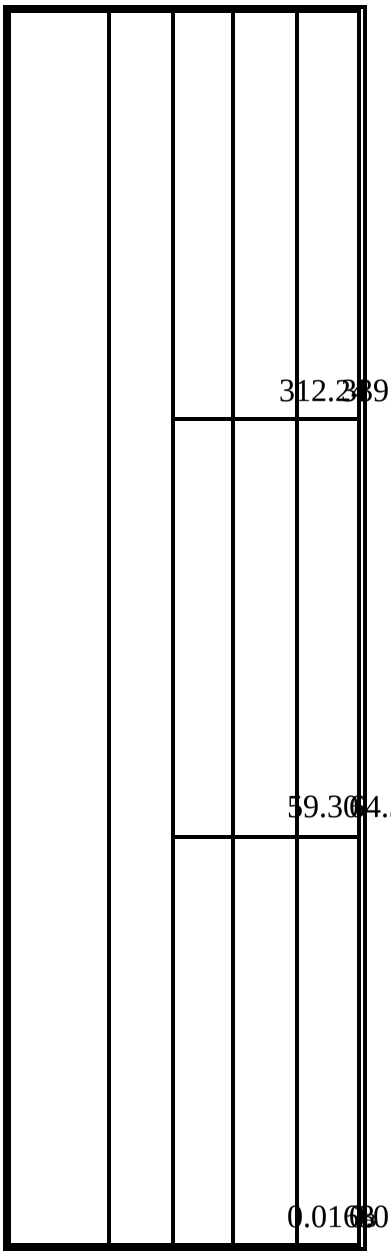
0.0082[B]	29.83	157.08
0.0088[C]	32.01	168.57
0.0099[D]	36.02	189.64



		1666	1	7.08
		316.	3	3.07
		0.087	0	1053



		784.	8	9.74
		324.	3	2.89
		0.087	0	1053



		312.	3	9.0
		59.3	0	4.3
		0.016	0	017